

# LEONARDO DA VINCI AS NEVER SEEN BEFORE

June 24, 2019 | Press Release  
Leonardo3 – Il Mondo di Leonardo | Pag. 1/6



## The Great Continuous Organ brings Leonardo's musical gifts back to life

The **Leonardo3** Research Center has collaborated with the City of Milan to **present one of Leonardo's most revolutionary musical inventions** for the very first time

The **Great Continuous Organ** is the latest to join the collection of **Leonardo's musical instruments on display at The World of Leonardo** show in **Piazza della Scala** – an **unprecedented collection** that is the most complete of its kind.



Leonardo3 Museum, Milan (Italy)

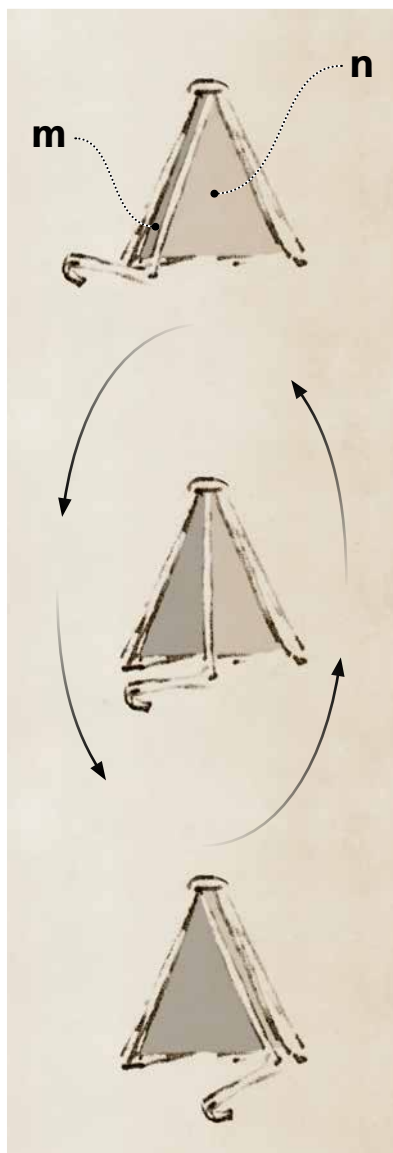
Milan, 24 June 2019 - *“The wind will thus be continuous”*, wrote Leonardo da Vinci in 1504 in his accompanying description for the drawings of **one of his greatest musical inventions**: the **Great Continuous Organ**. On the occasion of the 500<sup>th</sup> anniversary of Leonardo's death, **this instrument has been brought back to life thanks to the Leonardo3 Research Center in Milan**. The instrument was **played for the first time in history at a presentation co-organized by the City of Milan** in the Palazzina Liberty Dario Fo e Franca Rame. Says Councilor for Culture Filippo Del Corno: *“The quincentenary of Leonardo's death has sparked a surprising energy in the city involving public and private institutions, associations and companies in the creation of a constantly evolving events calendar. Leonardo3's initiative falls precisely within this virtuous participatory context, reminding us with this fascinating new project of the extraordinary creative heritage our city received because Leonardo lived and worked here.”* *“It's a historical event”*, says Massimiliano Lisa, President of Leonardo3.

**A totally new and perfectly functioning model of the Great Continuous Organ** has joined the **collection of musical instruments** created by the Universal Genius and displayed in the historic Sale del Re in **Piazza della Scala** (at the Galleria entrance) as part of the show **Leonardo3 – The World of Leonardo**. **The collection is the most complete of its kind in the world**, expertly **reconstructed by Leonardo3 researchers** using avant-garde technologies to make it **accessible to the public**.

*“This is the first time this reconstruction has been proposed. Of the dozens of musical instruments designed by Leonardo, the Great Continuous Organ probably functions the best”*, explains Edoardo Zanon, Leonardo3's co-founder and co-scientific-director also responsible for reconstructing the Great Kite and the Harpsichord-Viola. *“Leonardo introduced an innovative aspect to the power system with bellows that push air towards the pipes to avoid modifying the organ's traditional structure. We decided to reproduce the project by creating different working prototypes of the 'motor' apparatus described on folio 76r of the Madrid Codex II. The different prototypes we made – first virtually, then in reality – helped us understand the critical, innovative aspects upon which to base the final model”*.

The lengthy reconstruction work started out with **research and the meticulous study of historical sources**, in this case the *Madrid Codex II*. Analyses of the **original documents** together with the **knowledge of Leonardo's designs** acquired by the **Leonardo3 Research Center** over the years led to this **first-ever faithful, functioning, physical reconstruction of the organ**.





**"When bellows n opens, bellows m closes and vice-versa. The wind will thus be continuous"**

Leonardo da Vinci

## Leonardo's bellows revolutionize the organ

The **Great Continuous Organ** is the last of **three designs drawn by Leonardo on folio 76r of the Madrid Codex II**, which he dedicated entirely to the study of organs. This instrument's use in court festivals and theatrical spectacles and its **excellent sound performance intrigued Leonardo** so much that he **decided to contribute to its technical evolution**. He intuited that the production of air within the power system was subject to interruptions each time the bellows reached a standstill. By Leonardo's time, master organ-makers had already come up with different solutions, such as using a tank of temporary air (a sort of lung), but the efficiency of the bellows remained a problem. It was to this regard that Leonardo offered his particular solution.

**The instrument represents a big-little revolution: a large organ with a double-bellows system.** Leonardo wanted to create a bellows that could produce **uninterrupted airflow**, since the problem with organs was that the airflow needed to make them work required the presence of more than one player: one engaged on the keyboard while the other (the *bellows operator*) was focused on producing the airflow to power the organ's pipes by activating multiple bellows with their arms and feet. **With Leonardo's design, a musician could play the instrument without help** by using their feet to activate the double bellows on the sides of the organ thus leaving their hands free to play.

## The most complete collection of Leonardo's musical instruments in the world

The **musical instrument collection** included in the show *Leonardo3 – The World of Leonardo* already contains **the first two designs drawn by Leonardo inside the Madrid Codex II** and based on the idea of continuous airflow: the **Continuous Pipe** and the **Continuous Organ**. After a thorough study of the folio, a **reconstruction was made of its largest, most important design**: the double-bellows **Great Continuous Organ**.

The idea to reproduce **the most complete collection in the world of instruments designed by Leonardo da Vinci** has been around since **Leonardo3** was founded in 2005. The center is unique for applying both **technological research** and the **study, interpretation and comparison of original manuscripts** to the reconstruction of Leonardo's machines. The first instrument to be made was the *Harpsichord-Viola*, which was played for the first time in New York City in 2009. Since then, the research center has been continuously engaged in **recreating other musical designs by Leonardo**, thus creating **the most complete such collection in the world**.



Folio 76r of the Madrid Codex II





Mario Taddei



Edoardo Zanon

## An appointment for the public and "Leonardo's musical instruments"

As part of the Leonardo500 initiative, the show *Leonardo3 – The World of Leonardo* is offering free, thematic visits guided by the exhibition's curators. Until 16 April 2020, on one Thursday a month, the curators and researchers behind all the reconstructions in the show are proposing a series of thematic 45-minute encounters addressing different aspects of Leonardo's production and offering the public the unique experience to enter into the mind of the Genius from Vinci.

Another project in the works for the quincentenary is a reconstruction of the *CA176 Flying Machine*, whose inclusion in the show is expected for the fall. Leonardo drew this machine once he had abandoned the idea of flapping wings and understood the importance of the speed of airflow and wind.



## The most complete collection of musical instruments designed by the genius from Vinci

The collection contained in *The World of Leonardo* includes twelve totally new musical instruments and is the most complete in the world.

### Continuous-Wind Bagpipe (Madrid Codex II)

Folio 76r of the Madrid Codex II is **entirely dedicated to innovative designs of musical instruments**. Starting from the top, we can see a continuous bagpipe, a small portable bellows organ, a large double-bellows organ and, in the lowest part, a continuous bow mechanism. At the heart of all these instruments is the idea of **producing uninterrupted movement of air or a bow**. The design for the Continuous Bagpipe is described the best: the musician would wear the instrument using the belts drawn in the upper part of the page, moving their arm from side to side to pump air into the pipe. A hook attached to the player's belt would keep the instrument in place. **Leonardo's design is unique for including two bellows that work in an alternating way**. One would push air into the pipe while the other would refill and vice-versa. Uninterrupted airflow would be the result.



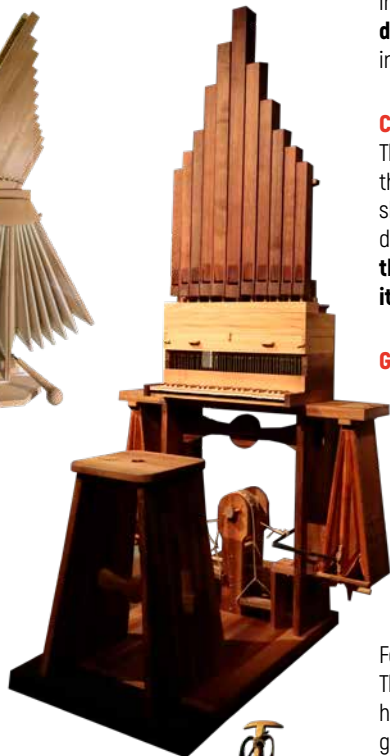
### Continuous Organ (Madrid Codex II)

The design for the (perfectly functioning) Continuous Organ is based on the same idea as that of the Continuous Bagpipe drawn on the same page. **The player would wear the instrument** using shoulder straps and a hook attached to their belt. With one arm they would move the bulkhead dividing the two bellows using a side-to-side movement. This way, **one bellows pushes air towards the pipes while the other fills up**. This instrument is **particularly interesting for the quality of its sound and intonation**. The **double bellows** distinguishes it from other small organs of its day.



### Great Continuous Organ (Madrid Codex II)

The drawing of the Great Continuous Organ is very small, but the design is extremely clear. Leonardo positioned two of his **double bellows** on either side of the organ. The musician could pump air with their legs and play with both hands free, **without any help**, while the system would ensure **continuous airflow**. **Leonardo's reconstruction has never been achieved before and is a worldwide first**. Of the dozens of musical instruments designed by Leonardo, the Great Continuous Organ probably functions the best. It was not Leonardo's intention to reinvent the instrument but to improve certain aspects.



### Harpsichord-Viola (Codex Atlanticus)

Folio 93r of the Codex Atlanticus is dedicated to the study of a musical instrument. The Codex Atlanticus is dedicated to the study of a very complex musical instrument that has never before seen the light of day. The small drawing in the lower part of the folio gives an extremely clear picture of the instrument and how it would be used. **Musicians could wear it using a belt and play it as they walk. Played as a keyboard instrument, it would emit a sound like that of a viola**, produced thanks to a long horse hair that, when the keys are pressed, would scratch the strings like in a string instrument. Unlike the viola, which is principally a monophonic instrument in that the bow can only "scratch" one string at a time, or two at the most, the Harpsichord-Viola can **play more than one note at the same time**. **The reconstruction proposed by Leonardo3 is the first functioning model ever created** and was baptized Harpsichord-Viola for combining the features of both these instruments.



### Giant Trumpet (Codex Arundel)

Leonardo meticulously described the design of a particular wind instrument that looks like an enormous low-pitched flute. However, the text refers explicitly to a trumpet. Leonardo addressed the problem typical of wind instruments with low tonalities whereby to produce low-pitched sounds such instruments can reach **remarkable lengths**, sometimes over six feet. The distance between the holes along the pipe therefore makes it impossible for it to be played by a single musician, whose fingers could only cover a much more restricted space. Leonardo resolved the problem by equipping the instrument with a **complex key system to serve as a mechanical finger extender so a musician could intercept even the farthest holes**. Low-pitched flutes using a single metal key to help the musician press the farthest keys already existed in the Renaissance, but nothing looked like the idea illustrated by Leonardo.







#### Stretch Drum (Codex Arundel)

The Stretch Drum can be considered **the ancestor of modern kettledrums**. The origins of the drum are lost to history, but Leonardo's proposal includes some important features, including the possibility to modify the intonation, a need that emerged with the instrument's use in an orchestra. **The musician could change the intonation by stretching or slackening the drum skin using the handle.** Traction would be achieved with a cage, most likely metallic, running along a screw and therefore exerting force along the edge of the drum.



#### Glissando Flutes (Codex Atlanticus)

Folio 1106r is full of drawings and appears as disorderly as most of the pages in the Codex Atlanticus. Among the various subjects is a paragraph tied to a drawing of two flutes: Glissando Flutes. These wind instruments allow players to go from one note to another in a continuous way, **without tonal intervals**, because of the smooth, uninterrupted fissure they have instead of the classic holes. Following Leonardo's indications, **a flautist can modulate a note's intonation** to their liking by moving their hands over the fissure, thus producing all the intermediate sounds among the hypothetical positions of the holes on a traditional flute (as Leonardo writes, also at 1/8 and 1/16 tonal intervals). **The design works**, as demonstrated by the instruments on display, and the sound is like that of today's valve whistles. The textual description is simplified, since Leonardo neglected to explain that to make these flutes, more than just create a simple fissure one must insert an internal chamber that moves with the player's hand, without which it would be impossible to produce the desired sounds.

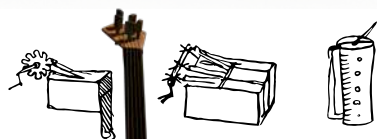


#### Musical Can(n)on (Codex Arundel)

Leonardo's manuscripts contain innovative, complex instruments like the Musical Can(n)on drawn on folio 136r of the Codex Arundel, which is now conserved in the British Library in London. Leonardo intended to build a wheel on which **four teeth simultaneously strike thin plates** to emit a sound from inside a pipe acting as a music box. An operator would activate the wheel simply by **turning the handle**. The wheel's movement and the consequent movement of the four teeth on the plates would produce **polyphonic music** (4 teeth = 4 sounds) in which each sound would continue to follow the others like in a canon. Hence the machine's name, a play on the words "musical canon", the Italian word canne meaning pipes (both mentioned by Leonardo) and a sort of "cannon" that shoots music instead of bullets. **The reconstruction proposed by Leonardo3 is the first ever made since Leonardo's time and the model works like a giant carillon.**

#### Rattles and Drum-Flute (Codex Arundel)

Leonardo introduced innovations to the other small instruments as well. In the first rattle, a little flap can **amplify or muffle the sound**. In the second one, the three thin plates can **produce harmonies**, thereby also **causing the strings on the box to vibrate**. Theoretically the small drum with holes could also be played like a flute in which one could **vary the sound's intonation** produced by the skins.



#### Silver Lyre

Some historians, including Vasari, relate that Leonardo gifted the Duke of Milan with a silver lyre that was shaped like a horse's skull and characterized by a very powerful timbre. **Unfortunately there is no trace of this design in the manuscripts** that have come down to us, so we needed to formulate some **hypotheses** for its reconstruction. Since the testimony makes it impossible to deduce the type of instrument Leonardo made, we produced three reconstructions of different sizes: two arm-held lyres and one leg-held lyre.



#### Talking Dragon (Codex Ashburnham)

The Codex Ashburnham contains the drawing of a sort of plucked-string musical instrument in the shape of a **dragon's head**. For the last two centuries it has been **erroneously identified as the drawing of Leonardo's famous lyre**. We nevertheless attempted the reconstruction, eventually concluding that it was intended more as an element for a **theatrical apparatus** than a real musical instrument. It should be noted that **this drawing was very likely not by Leonardo.**

## Leonardo3

The **Leonardo3** Research Center has been scientifically studying and disseminating the work of Leonardo da Vinci since 2004. In 2013 it launched the show **Leonardo3 – The World of Leonardo**, located in **Piazza della Scala** in Milan, at the Galleria Vittorio Emanuele II entrance. The exhibit has now become a *de facto* museum and represents **a unique occasion to discover and learn more about Leonardo's multifaceted gifts**. Visitors can engage with **over 200 interactive 3D machines and working physical reconstructions**, nearly all of which have **never been created before**. The **Patronage of the City of Milan** and the **Award of Recognition of the President of the Italian Republic** testify to the **originality** and **authority** of the **contents on display**.

Analyses of original manuscripts have led the Leonardo3 team to create **brand-new machines**, including the **Harpsichord-Viola**, the **Mechanical Lion**, the **Submarine**, the **Rapid-Fire Crossbow**, the **Great Kite** and many others. The exhibition allows visitors to **consult Leonardo's writings in digital format and engage with his inventions in totally new, intriguing ways using interactive and virtual-reality stations**. Each year the show's contents are renewed to make it engaging even for return visitors. **The World of Leonardo** is also part of the **Abbonamenti Musei Lombardia museum pass** and is among the top ten most visited sites.

As for Leonardo's artistic production, visitors particularly appreciate the **room dedicated to the Last Supper**. The digital restoration of the wall painting allows us to discover **details of the original that are now lost forever** and the reproduction on a wall support brings the restoration even closer to what the original would have looked like in 1498. The reconstruction of Leonardo's painting workshop in **real-time augmented reality** fascinates adults and children alike.

The show was created and is managed by the Leonardo3 Research Center founded by **Massimiliano Lisa**, **Edoardo Zanon** and **Mario Taddei** and is held in the historic rooms of the **Sale del Re** in **Piazza della Scala**, at the Galleria Vittorio Emanuele II entrance. These rooms were created for King Victor Emmanuel II in the Galleria in 1865. After a painstaking restoration, the Sale reopened their doors to host Leonardo da Vinci. **In 2018, the World of Leonardo was visited by over 180 thousand people**, thus becoming one of the most visited cultural destinations in Milan. With **over 200 thousand visitors predicted for 2019 the milestone of one million total visitors will be achieved by October**.

The **Leonardo3** Research Center **has created shows around the world**. The latest one opened in May at the Ronald Reagan Presidential Library and Museum (Simi Valley, USA) and displays original folios from the Codex Atlanticus in collaboration with the Ambrosiana Library. Previous shows have been held at the Expo Congress Center (Antalya, Turkey); the Ontario Science Center (Toronto, Canada); the Franklin Institute (Philadelphia, USA); the Museum of Science and Industry (Chicago, USA); the Museum of Islamic Art (Doha, Qatar) and many others.

## Leonardo3 Museum

Le Sale del Re, **Piazza della Scala** – Galleria Vittorio Emanuele II entrance  
In Milan until 31 December 2019 – Every day from 9:30am to 10:30pm (holidays included)

[www.leonardo3.net](http://www.leonardo3.net)

**Patronage of the City of Milan**

**Award of Recognition of the President of the Italian Republic**

**Tickets:** €12 (full); €10 (students, reduced and groups); €9 (youths 7-18 years old); €6 (school groups); €1 (children under 7).

Special family ticket: adults €10 (max two), children (7-14 years) €6.

## Contacts

### Information

tel. 02.495.199.81  
museum@leonardo3.net  
www.leonardo3.net  
www.facebook.com/  
leonardo3museum

### Schools, groups and guided visits

tel. 02.495.199.81  
gruppi@leonardo3.net

### Press office

#### DAG Communication

Barbara Orrico	Matteo Rasset
tel. 347.541.90.12	tel. 333.803.26.44
<a href="mailto:borrico@dagcom.com">borrico@dagcom.com</a>	<a href="mailto:mrasset@dagcom.com">mrasset@dagcom.com</a>

## Image download

Images for journalists can be found at:  
[www.leonardo3.net/en/press/images](http://www.leonardo3.net/en/press/images)